

### Amendments to the Claims

- 1. (Original)** A probe for detection and quantification of a lipid second messenger, which comprises:  
a polypeptide specifically bound to the lipid second messenger,  
two chromophores respectively having different fluorescence wavelengths,  
wherein each of the chromophores is linked to each end of the polypeptide through a rigid linker sequence; and  
a membrane localization sequence linked to one of the chromophores through a rigid linker sequence.
- 2. (Original)** The probe for detection and quantification of a lipid second messenger of claim 1, wherein the polypeptide specifically bound to the lipid second messenger is a lipid second messenger-binding protein.
- 3. (Original)** The probe for detection and quantification of a lipid second messenger of claim 2, wherein the lipid second messenger-binding protein is a pleckstrin homology domain from GRP1.
- 4. (Currently amended)** The probe for detection and quantification of a lipid second messenger of ~~any one of claims 1 to 3~~ claim 1, wherein the chromophores are a cyan fluorescent protein linked to N-terminal end of the polypeptide and a yellow fluorescent protein linked to C-terminal end of the polypeptide.
- 5. (Currently amended)** The probe for detection and quantification of a lipid second messenger of ~~any one of claims 1 to 4~~ claim 1, wherein the linker sequence is a rigid  $\alpha$ -helix linker consisting of repeated sequences of SEQ ID NO: 1.
- 6. (Currently amended)** The probe for detection and quantification of a lipid second messenger of ~~any one of claims 1 to 5~~ claim 1, wherein at least one linker sequence has a single di-glycine motif.

**7. (Currently amended)** The probe for detection and quantification of a lipid second messenger of ~~any one of claims 1 to 6~~ claim 1, wherein the membrane localization sequence is a lipidized sequence or a transmembrane sequence.

**8. (Currently amended)** A method for detecting and quantifying a lipid second messenger, which comprises:  
co-existing the probe for detection and quantification of a lipid second messenger of ~~any one of claims 1 to 7~~ claim 1 with the lipid second messenger; and  
measuring changes in fluorescence spectra.

**9. (Currently amended)** The method for detecting and quantifying a lipid second messenger according to claim 8, which comprises:  
introducing a polynucleotide to express the probe for detection and quantification of a lipid second messenger of ~~any one of claims 1 to 7~~ into cells; and  
co-existing the probe with the lipid second messenger.

**10. (Currently amended)** The method for detecting and quantifying a lipid second messenger according to claim 8, which comprises:  
introducing a polynucleotide to express the probe for detection and quantification of a lipid second messenger of ~~any one of claims 1 to 7~~ into a non-human totipotent cell;  
and  
ontogenizing the cell to non-human animal, thereby co-existing the probe with the lipid second messenger in all cells of the animal or offspring animal.

**11. (Currently amended)** The method for detecting and quantifying a lipid second messenger according to claim 9 ~~to 10~~, wherein the probe for detection and quantification of a lipid second messenger is fixed on membrane in the cells, and the lipid second messenger produced in the membrane is detected and quantified.

**12. (Currently amended)** A non-human animal or offspring animal thereof, which is obtained by:

introducing a polynucleotide to express the probe for detection and quantification of a lipid second messenger of ~~any one of claims 1 to 7~~ claim 1 into a non-human totipotent cell; and

ontogenizing the cell to the non-human animal.

**13. (Original)** A method for screening a substance for quantifying a lipid second messenger, in the cells of the non-human animal or offspring animal thereof of claim 12, which comprise introducing a test sample into the non-human animal or the offspring animal thereof.

**14. (New)** The method for detecting and quantifying a lipid second messenger according to claim 10, wherein the probe for detection and quantification of a lipid second messenger is fixed on membrane in the cells, and the lipid second messenger produced in the membrane is detected and quantified.